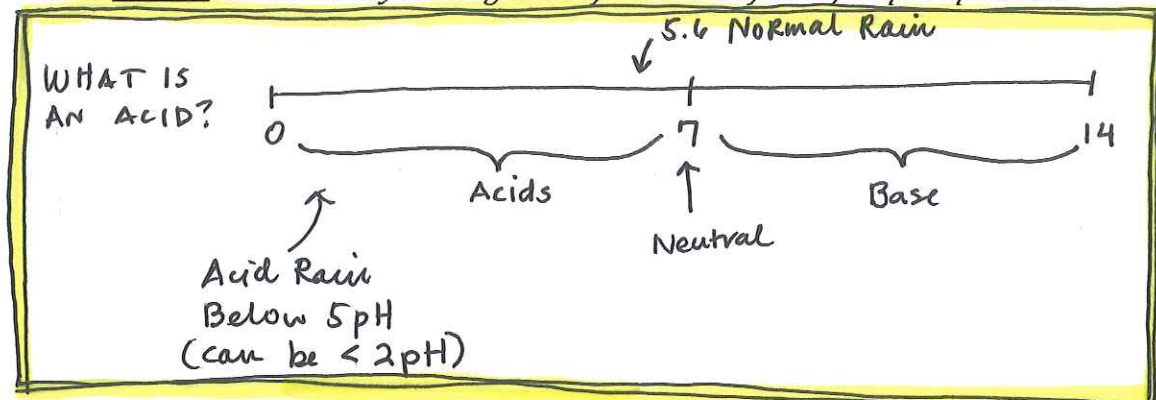


## Acid Precipitation

5.8.1 Outline the chemistry leading to the formation of acidified precipitation.



### Acid Deposition

- Acid comes down to earth
- can be wet or dry

### CAUSES:

primary pollutant

$\text{SO}_x$

$\text{NO}_x$

secondary pollutant

$\text{H}_2\text{SO}_4 \leftarrow$  Sulfuric Acid

$\text{HNO}_3 \leftarrow$  Nitric Acid

### Sulfur Based

(when sulfur-containing fuels are combusted  $\rightarrow$  common in coal + oil)



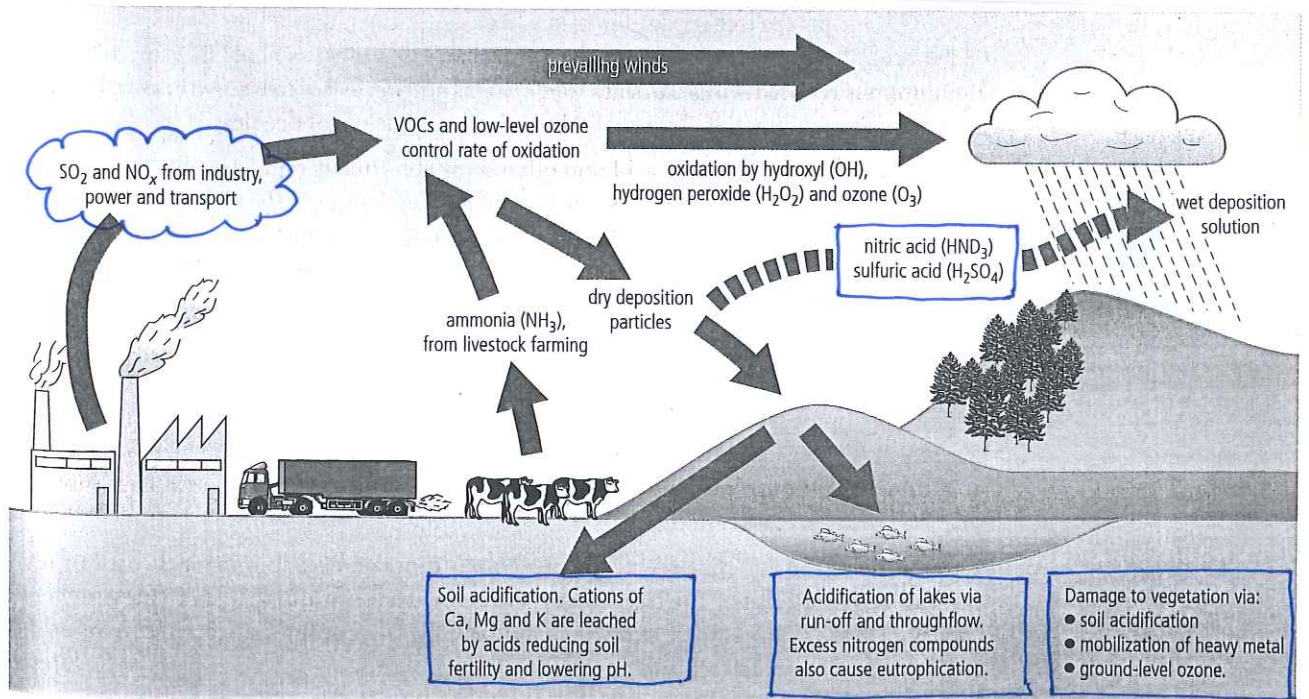
### Nitrogen Based

Nitrogen + oxygen reacting with temperature (happens when fuel combusts)



\* The Acids come down as:  
dust (dry)

Rain, snow, sleet etc (wet)



Soil

Water

Organisms

5.8.2 Describe three possible effects of acid deposition on soil, water, and living organisms.

**SOIL**

- Acid Reduces the ability of the soil particles to hold nutrients. (Calcium, Magnesium, potassium)
- Acid inhibits N-Fixing bacteria  $\rightarrow$  can't add N to soil.
- Some soil organisms can't tolerate changes to soil pH.

**WATER**

- Acidification of lakes & waterways  $\rightarrow$  organisms have specific ranges of pH  $\rightarrow$  ORGS. die if it gets too acidic
- Ocean Acidification causes Release of  $\text{CaCO}_3$  (Calcium Carbonate) found in coral reefs etc.)  
BIG IMPACT on Coral Reefs.  $\swarrow$
- Acids damage exoskeletons of some organisms.
- $\uparrow$  Nitrogen can lead to Eutrophication.

**LIVING ORGANISMS**

- Plants  $\rightarrow$  Hurt leaves, buds, + other structures
- Allow pathogens + insects easier access.
- $\downarrow$  Symbiotic bacteria in Roots  $\Rightarrow \downarrow$  N uptake
- $\downarrow$  pH in soil  $\Rightarrow \uparrow$  Aluminum in the  $\text{H}_2\text{O}$ .  
 $\uparrow$  Aluminum  $\Rightarrow$  Fish can't regulate water + salt.
- FISH + other Aquatic ORGS live in specific pH Range.
- LICHENS - INDICATOR species for Air Pollution.
- $\downarrow$  Plants ability to do photosynthesis

**OTHER IMPACTS**

- Damage to Buildings + Monuments.
- $\uparrow$  Corrosion of metals.

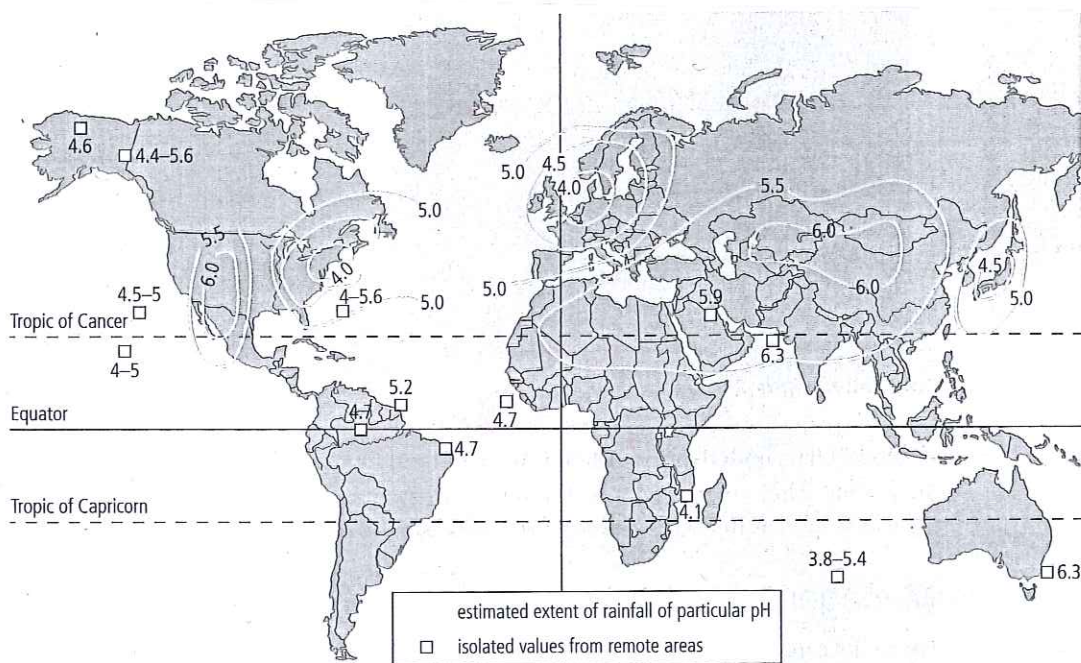


5.8.3 Explain why the effect of acid deposition is regional rather than global.

<p>EXAMPLES of:</p> <p><b>Regional Issues</b></p>	<p><b>GLOBAL ISSUES</b></p>
<p>Acid Precipitation</p> <p>Tropospheric Ozone</p> <p>Photochemical Smog</p> <p>Eutrophication</p>	<p>Global Warming</p> <p>Hole in the Ozone</p>

Once pollutants in the atmosphere they precipitate down in the same area → they don't travel.

\* Impact of Acid Rain has different Scale depending on geology (type of Rocks) of the area.



\* Areas impacted Are:

- industrialized
- downwind from areas where Fossil Fuels burn
- Colder areas are more affected
- upland areas w/ high rainfall.
- contain lots of forests, streams + lakes
- thin soils.

#### 5.8.4 Describe and evaluate pollution management strategies for acid deposition

##### Human Activity:

- Replace Fossil Fuels by using Renewable Sources
- Reduce demand for electricity (more E efficient appliances + cars)
- ↑ public transport
- low sulfur fuels, Remove sulfur beforehand

##### Regulate & Reduce:

- clean up technologies @ "the end of the pipe" (carbon scrubbers)
- Catalytic converters convert  $\text{NO}_x$  back to  $\text{N}_2$

##### Clean Up & Restoration:

- Liming acidified lakes + waterways (neutralizes the acid)
- Liming forests
- International Agreements

✓ 1991 Air Quality Agreement  
bwt. US + Canada focuses on  
Acid Rain.

\* 1999 Gothenburg Agreement in  
Europe is meant to ↓ Air Pollution